

BP-220 Noninvasive Blood Pressure Sensor

Technical Note



BP-220

Overview

A person's cardiac output, peripheral vascular resistance, blood pressure, and other cardiovascular parameters change in response to the activities and events taking place in the person's daily schedule. A device like the BP-220 Noninvasive Blood Pressure Sensor makes it easy to study the changes in blood pressure that take place over the course of an event or an activity. The BP-220 has two major components: a blood pressure cuff used to occlude the flow of blood in a subject's brachial artery; and a pressure transducer used to monitor the pressures in the cuff that correspond to the systolic and diastolic blood pressures. The output of the pressure transducer is a voltage that can be recorded by an iWorx data acquisition unit and converted into units of pressure (mmHg) by calibration.

After blood flow in the subject's arm is occluded, the pressure is released from the cuff by another student who is listening for the return of pulsatile blood flow in the arm. The first Korotkoff sound to be heard occurs at the systolic pressure and the last Korotkoff sound is at the diastolic pressure. To make it easier for students to find the systolic and diastolic pressures, the output of a pulse transducer attached to the subject's finger can be used to indicate the presence or absence of blood flow in the arm before, during, and after the occlusion of the subject's brachial artery.



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How It Works

When the blood pressure cuff is placed on a subject's upper arm and inflated to a pressure above that person's systolic pressure, blood flow to the lower arm is occluded so that a pulse wave will not be seen when a pulse plethysmograph is used. As pressure is released from the cuff, the output of the pressure transducer will go down. Blood will begin to flow as the pressure in the cuff falls below the subject's systolic pressure. The pressure at which the pulse is first seen on the recording from the pulse plethysmograph can be identified on the recording by a mark that labels the systolic pressure. As the pressure continues to be released from the cuff and the output of the pressure continues to go down, the amplitude of the pulse wave increases up to a maximum. The pressure at which the first maximum amplitude pulse wave is seen during the release of pressure from the cuff is the diastolic pressure.

How to Use the BP-220 with the IXTA

Equipment Setup

Plug the tubing connector of the BP-220 into the channel labeled A2 on the front of the IXTA.

Calibration of the BP-220

- 1) Lay the cuff of the BP-220 on the lab table.
- 2) Click on the Record button, located on the upper right side of the LabScribe Main window. The signal should begin scrolling across the screen.
- 3) Record data while the cuff is laying on the table for about 10 seconds.
- 4) Select Save As in the File menu, type a name for the file. Choose a destination on the computer in which to save the file, like your lab group folder. Designate the file type as *.iwxddata. Click on the Save button to save the data file.
- 5) Scroll to the beginning of the calibration data.
- 6) Use the Display Time icons to adjust the Display Time of the Main window to show the 10 second set of data on the Main window at the same time. The required data can also be selected by:
 - Placing the cursors on either side of data required,
 - Clicking the Zoom between Cursors button on the LabScribe toolbar to expand the segment with the four selected pulse cycles to the width of the Main window.
- 7) Click the 2-Cursor icon so that two cursors appear on the Main window. Place one cursor on the beginning of the flat section of data and the second cursor on the flat section of data collected approximately 10 seconds later.



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- 8) To convert the voltages at the positions of the cursors to the correct pressure values, use the Units Offset dialogue window. To access this dialogue window, click on the arrow to the left of the channel title, Blood Pressure, to open the channel menu. Select Units from the channel menu, and select Set Offset from the Units submenu.
- 9) On the units conversion window, put a check mark in the box next to Apply units to all blocks. Set Mean Value between Cursors to "0". Click on the OK button in the lower right corner of the window to activate the units conversion.

Using the BP-220 Blood Pressure Sensor with a pulse plethysmograph

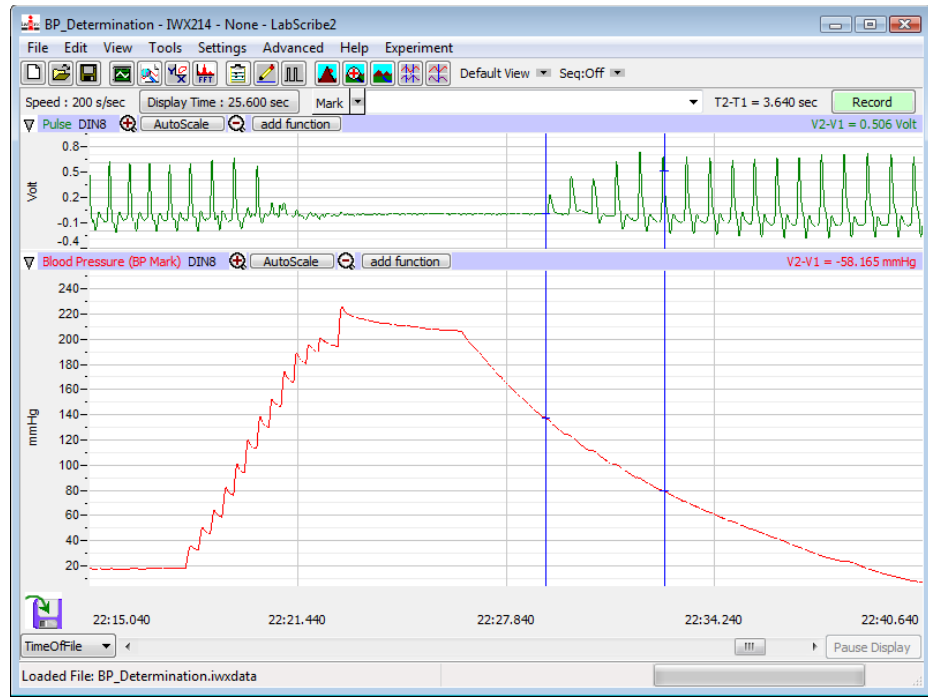
- 1) Click **Record** to begin recording the subject's pulse wave and the pressure in the cuff of the blood pressure sensor. Inflate the blood pressure cuff until the finger pulse wave on the pulse channel disappears.
- 2) Once the pulse wave disappears, release the cuff pressure at the rate of 10 mmHg per second. Continue to release the cuff pressure until the trace reads 0 mmHg. Click the **Stop** button.
- 3) Scroll to the section of data recorded while the pressure in the cuff was being released. Use the **Display Time** icons on the LabScribe toolbar to display the data that includes the reappearance of the pulse wave and its return to maximum amplitude on one screen.
- 4) Click the **1 Cursor** icon on the LabScribe toolbar to place a single blue cursor on the window.
- 5) On the pulse channel, find the first detectable pulse wave that occurs as pressure is released from the cuff. Place the cursor over this pulse wave.
- 6) The pressure in the cuff during this particular pulse wave is equal to the systolic blood pressure of the subject. Look in the upper right corner of the data window for the blood pressure channel to find the systolic blood pressure. It is listed next to the label **Value (V)**.
- 7) To the right of the cursor, the amplitude of the pulse wave increases as the pressure in the cuff decreases. In this sequence of progressively larger pulse waves, find the first pulse wave that has the greatest amplitude. Place the single cursor on the peak of this pulse wave.
- 8) The pressure in the cuff during this particular pulse wave is equal to the diastolic blood pressure of the subject. Look in the upper right corner of the data window for the blood pressure channel to find the diastolic blood pressure. It is listed next to the label **Value (V)**.
- 9) See the sample LabScribe recording on the next page. It shows the BP-220 and pulse plethysmograph channels with two cursors indicating the systolic and diastolic blood pressures.



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LabScribe recording of BP-220 and pulse plethysmograph

Experiments

LabScribe experiments using the BP-220 Noninvasive Blood Pressure Sensor include:

- **Experiment HC-1: Blood Pressure, Peripheral Circulation, and Body Position** (found in the **Human Circulation** category of the LabScribe **Settings** menu as **BloodPressure-BodyPosition**)
- **Experiment HC-2: Blood Pressure, Peripheral Circulation, and Imposed Conditions** (found in the **Human Circulation** category of the LabScribe **Settings** menu as **BloodPressure-ImposedConditions**)
- **Experiment HC-5: Body Position, Exercise, and Cardiac Output** (found in the **Human Circulation** category of the LabScribe **Settings** menu as **CardiacOutput**)
- **Experiment HC-4: Pulse Contour Analysis** (found in the **Human Circulation** category of the LabScribe **Settings** menu as **PulseContourAnalysis**)



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Technical Data and Specifications

SPECIFICATIONS	
Impedance	<900 ohms Ω
Sensitivity	5 $\mu\text{V/V/mmHg}$
Excitation Voltage	+4 VDC
Operating Pressure	+0.50 to +300 mmHg
Temperature Effect	+0.25 mmHg/ $^{\circ}\text{C}$



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